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Polyester film for coating inner surface of can - comprises acid components contg. terephthalic acid and isophthalic acid and/or phthalic and acid, glycol component
Patent Assignee: TOYOBO KK
Inventors: WATANABE T

Patent Family (2 patents, 1 country)

Patent Number	Kind	Date	Application Number	Kind	Date	Update	Type
JP 2057339	A	19900227	JP 1988208600	A	19880822	199014	B
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Patent Details

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JP 2057339	A	JA	6	0	
JP 2621406	B2	JA	4	0	Previously issued patent JP 02057339

Alerting Abstract: JP A

The polyester comprises (A) acid components comprising 50 - 95 mol. % terephthalic acid and 50 - 5 mol. % isophthalic acid and/or phthalic acid and (B) a glycol component comprising a 2 - 5C glycol. It has an SG of upto 1.350 as measured by Micro Raman spectrography for the sample after heat-treatment at 210 deg. C for 2 mins.

Typically the polyester has a melt bonding temp. of 200 - 240 deg. C and a moderate crystallinity as measured by the SG of upto 1.350 by Micro Raman spectrography. The polyester having its high SG enhances the crystallisation after the prepn. of the can to degrade the material. The polyester is opt. blended with a lubricant (e.g. CaCO3, etc.) to improve the laminating workability or is surface treated by eg. corona discharge for improving adhesion with the metal.

USE/ADVANTAGE - The polyester coated on a metal plate is melt bonded firmly with the metal and compatible with the deformation of the metal withour breaking during drawing working in the steps for making cans. It withstands the heat-treatment after the prepn. of cans. It has high resistance against change in the flavour of foods in the can.

International Classification (Main): B32B-015/08 (Additional/Secondary): C08G-063/18, C08G-063/183, C08J-005/18, C08L-067/02

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POLYESTER FILM FOR COATING INTERIOR OF METAL CAN AND METAL CAN
Assignee: TOYOBO CO LTD (TOYM)
Inventor: WATANABE TAKEHIKO
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審査請求　未請求　請求項の数 2　（全6頁）

⑭発明の名称　金属缶内装用ポリエステルフィルム及び金属缶

⑳特　願　昭63−208600
㉒出　願　昭63(1988)8月22日

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明　細　書

1．発明の名称

金属缶内装用ポリエステルフィルム及び金属缶

2．特許請求の範囲

(1) 酸成分が、テレフタル酸：50～95モル%、イソフタル酸及び／又はオルソフタル酸：50～5モル%からなり、

グリコール成分が、炭素数2～5のグリコールからなるポリエステル原料によって形成され、210℃、2分の温度条件下で熱処理した後のマイクロウマン法による比屈が1.350以下であることを特徴とする金属缶内装用ポリエステルフィルム。

(2) 請求項(1)のポリエステルフィルムを内装してなる金属缶。

3．発明の詳細な説明

［産業上の利用分野］

本発明は、耐熱性及び保香性（耐フレーバー性）に優れた金属缶内装用ポリエステルフィルムに関し、殊に金属缶製造過程中に遭遇する種々の環境に対して安定であり、製缶の内面において剥離やクラック等の欠陥を生じることが少ない金属缶内装用ポリエステルフィルム及び該フィルムを内装してなる金属缶に関するものである。

［従来の技術］

製缶技術並びに缶用素材技術の進歩により、食料用缶に飲料用の金属缶の生産は飛躍的な伸びを示している。こうした金属缶の材質としては、Al、Fe及びこの両者の複合材料であるバイメタル材等が利用されており、打ち抜き加工、絞り加工、しごき加工等を駆使して缶体の製造が行なわれている。こうして得られた金属缶の内部には、内容物の風味やフレーバーを損なわない様に、また缶素材の腐食を防止し得る様に内装材が施設されている。

金属缶内装材としては、まず毒性がなく、加熱殺菌処理に耐えることができ、溶出物質量の少ない素材であることが要求され、さらに金属缶との接着性や加工性が良好であり、その上で耐フレーバー性に優れたものが求められており、従来、こ

の様な金属缶内装材としてはポリ塩化ビニル系樹脂が採用され、これをスプレーコーティングによって金属缶内面に塗膜する手法が採られていた。

しかるにポリ塩化ビニル系樹脂は焼却時に塩素ガスが発生するという問題があると共にバリヤー性能が不十分で、且つ衛生性にも問題がある。一方スプレーコーティング法自体も、工程的に見てその操作が煩雑であり、生産コストが高いという欠点がある。こうした理由からポリ塩化ビニル系樹脂のスプレーコーティング技術に対しては必らずしも満足が得られている訳ではなく、これに替わる技術が要望されているのが現状である。

［発明が解決しようとする課題］

本発明者等は、こうした状況のもとで、スプレーコーティングに替る技術について種々検討を重ねた結果、金属缶内面にプラスチックフィルムをラミネートするという方法を立てて見た。しかして該ラミネート用フィルムについては、金属缶内装材用として必要な前記特性の全てを満足することが要求されるのでその選択が難しく、選択の如何によって上記方法の成否が左右されるとも言える。本発明者等はこれらの条件を満足し、特に食品の風味やフレーバーを損わず、且つ安価な金属缶内装用フィルムを提供すべく鋭意検討を重ねた結果、本発明を完成するに至った。

［課題を解決するための手段］

即ち本発明は、酸成分が、テレフタル酸：５０～９５モル%、イソフタル酸及び／又はオルソフタル酸：５０～５モル%からなり、グリコール成分が、炭素数２～５のグリコールからなるポリエステル原料によって形成され、２１０℃、２分の溶融条件下で熱処理したときのMicroRaman法による比重が1.350 以下である点に要旨を有する金属缶内装用ポリエステルフィルム及び該フィルムを内装してなる金属缶を提供するものである。

［作用］

スプレーコーティング法の場合には、製缶後の缶内面にポリ塩化ビニル樹脂等のスプレーコーティングを行なっていたので金属缶１個毎にスプレー操作を行なわなければならず生産性の向上には限界がある。これに対し金属缶内面にフィルムをラミネートする場合には缶形状に成形する前の金属板にフィルムをラミネートした後製缶工程に入るという手法を採用することができるので、操作は大幅に簡素化されて生産性を高めることができ、金属缶内面への内装材の被設を経済的に実施することができるとの期待が持たれた。前金属板へフィルムをラミネートする技術そのものについては、金属板製造の過程でラミネートするか、あるいは金属板を製造した後、別工程でフィルムをラミネートするかは自由である。

ところがこの様にラミネートされたフィルムは、金属板と一緒になって製缶工程中の過酷な変形加工を受け、更に金属板の塑性変形に伴なって発生する熱は金属缶外面への印刷の際及び食品殺菌処理の際の高熱を受ける。その為、これらの工程を通過してもフィルムの特性が劣化しないことが要求される。換言すれば製缶、印刷、殺菌処理等の諸工程を透過した後においても十分な耐フレーバー性、缶内面との接着性、防食の為の保護性等を備えていることが重要となる。

こうした観点から種々のプラスチックフィルムについて、各特性の安定性について検討したが、ポリオレフィンやポリアマイドなどの多くの汎用素材は耐熱性や保香性の点で不十分であり、ポリエステルフィルムが最適であることを確認した。

ところで金属板にポリエステルフィルムをラミネートするに当たっては、接着剤を使用したときは接着剤の毒性や耐熱性等が問題となり、接着力の経時低下によるラミネートフィルムの剥離といった本態も考えられる。又接着剤を使用すれば当然ラミネートコストが上昇することにもなる。そこで本発明では接着剤を使用することなく、即ち金属缶内面に融着することができるラミネート用フィルムであることを基準としてポリエステルフィルムを選択することとした。そして種々のポリエステルフィルムを金属板に融着してみると、多くのポリエステルフィルムは融点に近い温度で

金属板にラミネート（融着）することのできることが確認され、中でも非晶質性であることが種々の観点から好ましいことが分かった。

即ち結晶性ポリエステルの場合は、ラミネートしたときには結晶性が消れて非晶質状態になっているが、製缶、印刷、加熱殺菌などの工程で熱を受けると結晶化が進み、ラミネートしたフィルムがもろくなって剥離したり、クラックを発生することが分かった。そこで本発明では製缶工程以降の熱履歴によってフィルム特性が劣化することのない様に結晶化の問題のない非晶性ポリエステル乃至結晶性の低いポリエステルを求めて更に研究を重ねた結果、前記構成で示される本発明の金属缶内装用ポリエステルフィルムを完成するに至った。

以下実施例説明を混じえて本発明をさらに詳細に説明する。まずフィルムの基本的特性として食品の風味やフレーバーを保持する性能に優れていることが重要であり、これを備えたポリエステルフィルムを見出すべく、種々のポリエステルの保香性を調べたところ第1表に示す結果が得られた。

（以下余白）

第　1　表

		グリコール成分								
		EG	PG	EG／PG（モル分率）	EG／DEG（モル分率）	EG／1,4 BG（モル分率）	EG／NPG（モル分率）	EG／CHDM（モル分率）	1,4 BG	1,6 HD
酸成分	TPA	◎	◎	○ 95/05	○ 96/04	○ 96/04	○ 92/08	× 70/30	○	×
	TPA／IPA (80/20)	○	○	○ 〃	○ 〃	△ 〃	△ 〃	× 〃	△	×
	TPA／IPA (88/12)	○	○	○ 〃	○ 〃	○ 〃	△ 〃	× 〃	△	×
	TPA／IPA (90/10)	○	○	○ 〃	○ 〃	○ 〃	○ 〃	× 〃	○	×
	SA	×	×	× 〃	× 〃	× 〃	× 〃	× 〃	×	×

注）EG　：エチレングリコール　　CHDM：シクロヘキサンジメチルアルコール
PG　：プロピレングリコール　　1,6-HD　：1,6-ヘキサンジオール
DEG：ジエチレングリコール　　TPA　：テレフタル酸
1,4-BG：1,4-ブチレングリコール　　IPA　：イソフタル酸
NPG：ネオペンチルグリコール　　SA　：セバシン酸

保香性評価　◎：　優れている　○：　良好　△：　やや不良　×：　不良
表中の数字はモル比率を示す。

この実験結果より酸成分がＴＰＡあるいはＴＰＡとＩＰＡの混合物であり、グリコール成分がＥＧ，ＰＧ，１，４－ＢＧから選ばれる１種以上の成分であるポリエステルフィルムの場合は特に耐フレーバー性に優れていることが分かった。これに対し、酸成分がセバシン酸であるポリエステルやグリコール成分が１，６－ＨＤであるポリエステルフィルムは耐フレーバー性の観点から排除されるべきであることが分かった。

一方上記耐フレーバー性の良好なポリエステルフィルムの中でも、酸成分がＴＰＡ１００％であり、共重合成分としてＩＰＡ等を全く含まないポリエステルフィルムは、結晶性が強く、ラミネート後の熱履歴によって結晶化が進み、剥離やクラックを発生し易い。従ってラミネート後の熱劣化等を考慮すれば、酸成分がＴＰＡ単独であるポリエステルフィルムを採用することはできない。又本発明に係るポリエステルフィルムは、金属板に対して融着する必要があるので、融着温度（一般に２００～２４０℃）で分解せず安定した品質を保つものでなければならない。もっともある程度融解しなければ融着そのものが不可能あるいは不安定になるので融点は２４０℃以下であることが望ましい。

こうした諸要求を満足するポリエステルフィルムについて検討を重ねた結果、前記構成に示される様に酸成分が、テレフタル酸：５０～９５モル％、イソフタル酸及び／又はオルソフタル酸：５～５０モル％からなり、グリコール成分が、炭素数２～５のグリコールであるポリエステルフィルムが上記要求に適合するうちのであることが分かった。但し上記要件を満足するだけでは酸成分とグリコール成分の組合せ及び組成によっては製缶工程以降の熱環境下において結晶化度が高くなりすぎる恐れがあるので、結晶化度は上記酸成分とグリコール成分の配合比を上記配合比率の範囲内で適宜調整しなければならない。そしてこうした配合比調整の尺度となるのが下記熱処理条件でポリエステルフィルムを処理したときの比重（Micro Raman 法で測定）である。

熱処理条件２１０℃×２分

即ち本発明に係るポリエステルフィルムは、上記熱処理後の比重が1.350 以下であることが不可欠であり、該比重が1.350 を超えると、製缶工程以降の熱環境において結晶化が過度に進行し、材質の劣化を引き起こす。

本発明の基本構成は以上の通りであるが、フィルム製造工程及び金属板へのラミネート工程における加工性を上げることを目的として炭酸カルシウムやサイロイドなどの滑剤を添加したり、必要に応じて金属板に対する接着性を改良する目的でフィルムの片面にコロナ放電処理や化学処理などの表面処理を施してもよい。更にポリエステル改良剤などの添加剤を加えることも許される。尚通常のポリエステルフィルムではレトルト処理（１３０℃×３０分）をすると白化するなどの問題が発生するが、この対策としてコポリエステルを添加すると白化の問題が解決する。

又本発明に係るポリエステルフィルムは、一軸方向さらには２軸方向に延伸されたものであることが望ましく、延伸方向と製缶時のフィルム変形方向を一致させることによって製缶時のフィルム損傷を減少させることができる。さらにフィルムの厚みは９～５０μm 最も好ましくは２０～２５μm とすることが望まれ、９μm 未満ではフィルム厚さが小さすぎる為に製缶加工時に破れ等が生じ易くなる。一方５０μm を超えるのは過剰品質であり不経済である。

又、本発明ポリエステルフィルムの被覆対象となる金属缶の材質としては前述のＡｌ，Ｆｅ及びこれらのバイメタル材等が例示され、その内面に前述の工程に従い本発明フィルムを被覆することによって本発明金属缶を得ることができる。尚金属缶素材の外面相当側には絞り加工等の際の加工性を向上させる目的でＳｎめっき等を施しておくことが推奨される。

［実施例］

(i)　ホモポリマー：ＴＰＡ／ＥＧ
＝100 ／100 （重量部）

(ii)　コポリマー：ＴＰＡ／ＩＰＡ／ＥＧ

＝78／22／100（重量部）

(iii) TPA／IPA／EG＝78／22／100（重量部）のコポリマーからなる2軸延伸フィルム

上記(i)～(ii)のポリマー若しくは(iii)のフィルムの比重（S．G）をMicro Beam法によって測定したところ、第2表に示す結果が得られた。

（以下余白）

第　2　表

		比　重
(i) ホモポリマー	非晶部	1.33
	結晶部	1.398
(ii) コポリマー		1.3316～1.3364
(iii) 2軸延伸フィルム		1.3387

（以下余白）

次に種々の組成のポリエステルフィルム及び該フィルムを下記条件で熱処理して得たフィルムの比重を同様に測定したところ第3表に示す結果が得られた。

熱処理条件210℃×2分

（以下余白）

PATENT ABSTRACTS OF JAPAN

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(71)Applicant : TOYOBO CO LTD

(72)Inventor : WATANABE TAKEHIKO

(54) POLYESTER FILM FOR COATING INTERIOR OF METAL CAN AND METAL CAN

(57)Abstract:

PURPOSE: To prevent peeling or cracking and to improve flavor resistance by forming a film of a polyester material having the acid content of specific ratios of isophthalic acid terephthalic acid and/or orthophthalic acid, and glycol content of specific number of carbons, heat treating it, and setting its specific weight by a MicroRaman method to a specific value or less.

CONSTITUTION: The acid content of polyester film for coating the interior of a metal can contains 50 - 95 mol% of telephthalic acid, and 50 - 5mol% of orthophthalic acid, and glycol content of 2-5C, and its specific weight by a MicroRaman method when it is heat treated under temperature conditions of 210°C and 2 minutes is set to 1.350 or less. When the film is laminated on the inner face of the can, the film is laminated on a metal plate before it is molded in a can shape, and entered to a can manufacturing step. Accordingly, the operations are largely simplified to enhance its productivity.

PTO 08-6606

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METAL CAN LINING POLYESTER FILM AND METAL CAN
[Kinzoku kan yo poriesuteru fuirumu oyobi kinzoku kan]

Takehiko Watanabe

UNITED STATES PATENT AND TRADEMARK OFFICE
WASHINGTON, D.C. JULY 2008
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INVENTOR	(72):	Takehiko Watanabe
APPLICANT	(71):	Toyobo Co., Ltd.
TITLE	(54):	METAL CAN LINING POLYESTER FILM AND METAL CAN
FOREIGN TITLE	[54A]:	Kinzoku kan yo poriesuteru fuirumu oyobi kinzoku kan

Claims /1*

1. A metal can lining polyester film characterized in that it is made of a polyester raw material comprising 50-95 mol% of terephthalic acid and 50-5 mol% of isophthalic acid as its acidic elements and/or orthophthalic acid and

glycols with a carbon number 2 ~ 5 as its glycolic elements, and

its specific gravity measured by means of Micro Raman method is 1.350 or lower after treated thermally under the temperature condition of 210°C for 2 min.

2. A metal can that utilizes the polyester film in Claim 1 as a lining.

Detailed explanation of the invention

Industrial application field

The present invention pertains to a metal can lining polyester film with an excellent heat-resisting property and is stable to odors (a flavor-proof property). In particular, it pertains to a metal can lining polyester film that is stable regardless of the variety of environments it is exposed to during the metal can manufacturing process in that such flaws as exfoliation and cracks in the inner surface of a can product are unlikely and a metal can that utilizes said film for lining.

Prior art

Due to advancements in can making technology and can materials technology, production of cans for foods, especially beverages, is expanding drastically. Al, Fe, and bimetal composite materials, for example, are used as materials for those metal cans; and can bodies are manufactured by means of punching, drawing, and ironing, for example. A lining material is affixed to the inner surface of a metal

* [Numbers in right margin indicate pagination of the original text.]

can manufactured in said manner in order to prevent the content from losing its taste and flavor while preventing the can material from becoming corroded.

As a metal can lining material, a material that is nontoxic and tolerant of heat sterilization processing with little eluted substances must be used, and that it must have good adhesiveness to the metal can and good workability as well as an excellent flavor-proof property. As such, a polyvinyl chloride system resin has long been used as material can lining material of this kind, and said [resin] is affixed to the /2 inner surface of the can by means of a spray-coating technique.

However, the polyvinyl chloride system resin is problematic not only in that a chlorine gas is generated when it is burned, but it also has a hygienic problem due to its insufficient barrier property. On the other hand, the spray-coating method itself is disadvantageous in that because it involves complicated operations in terms of process, the production cost becomes high. Due to the reasons given above, the polyvinyl chloride system resin spray-coating technique is not necessarily satisfactory, and there are demands for techniques that would replace said [spray-coating technique] as the current situation.

Problem to be solved by the invention

Given said situation, the present inventors examined a variety of techniques that would replace the spray-coating and came up with a policy to laminate a plastic film on the inner surface of a metal can to see if it would work. However, it is difficult to choose a film to be used for said lamination because all of the aforementioned characteristics that are required of a metal can lining material have to be satisfied. As such, it can be said that success or failure of the aforementioned policy depends on the selection [of the lining material]. The present inventors conducted rigorous examinations in order to present a metal can lining film that would satisfy all the requirements, especially an inexpensive [lining film] that would

prevent the taste and the flavor of a food from being compromised, before completing the present invention.

Means to solve the problem

That is, the present invention presents a metal can lining polyester film, whose gist lies in the point that it is made of a polyester raw material comprising 50 ~ 95 mol% of terephthalic acid and 50 ~ 5 mol% of isophthalic acid as its acidic elements and/or orthophthalic acid and glycols with a carbon number 2 ~ 5 as its glycolic elements, and its specific gravity measured by means of Micro Raman method is 1.350 or lower after treated thermally under the temperature condition of 210°C for 2 min, as well as a metal can on which said film is affixed internally.

Function

When the spray-coating is used, because the polyvinyl chloride system resin is sprayed on the inner surface of the can after the can is manufactured, the spraying operation has to be carried out for each metal can, so that improvement of the productivity is limited. To the contrary, when a film is laminated on a metal plate, because a technique in which the film is laminated on the metal plate before it is formed into the can shape prior to the can making step can be adopted, the operations can be simplified significantly, so that the productivity can be improved. As such, it was expected that the lining material would be able to be affixed the inner surface of the metal can economically. As for the specific technique for laminating the film on the metal can, a decision may be made arbitrarily that the lamination is carried out during the manufacturing of the metal can, or the film is laminated in a separated step after the metal can is manufactured.

However, the film laminated in said manner is subjected to severe deformational machining together with the metal plate, and it is further subjected to heat generated due to plastic deformation of the metal

plate or intense heat that is applied when printing on the outer surface of the metal can and during the sterilization processing of the food. Thus, the film characteristics must not be damaged when put through said steps. In other words, it is critical that sufficient flavor-proof property, adhesiveness to the inner surface of the can, and protection against corrosion are retained even when going through the can-making, printing, and sterilization steps.

Stabilities of the respective characteristics were examined of a variety of plastic films from the aforementioned viewpoints, and it was confirmed that many general-purpose materials, such as polyolefin and polyamide, were not sufficient in terms of heat-resistance and aroma-retaining properties; and that a polyester film was most suitable.

Incidentally, when laminating the polyester film on the metal plate, if an adhesive is used, the toxicity and heat-resistance of the adhesive become issues, and that it is also possible that the laminated film may fall off due to deterioration of the adhesive over time. Also, the cost of the laminate increases when an adhesive is involved as a matter of course. Thus, in the present invention, a polyester film was selected based on a standard that the film must be able to be laminated on the inner surface of the metal can without using any adhesive, that is, it must be able to be fused. When various kinds polyester films were actually fused to the metal plate, it was confirmed that it they were able to be laminated (fused) onto the /3

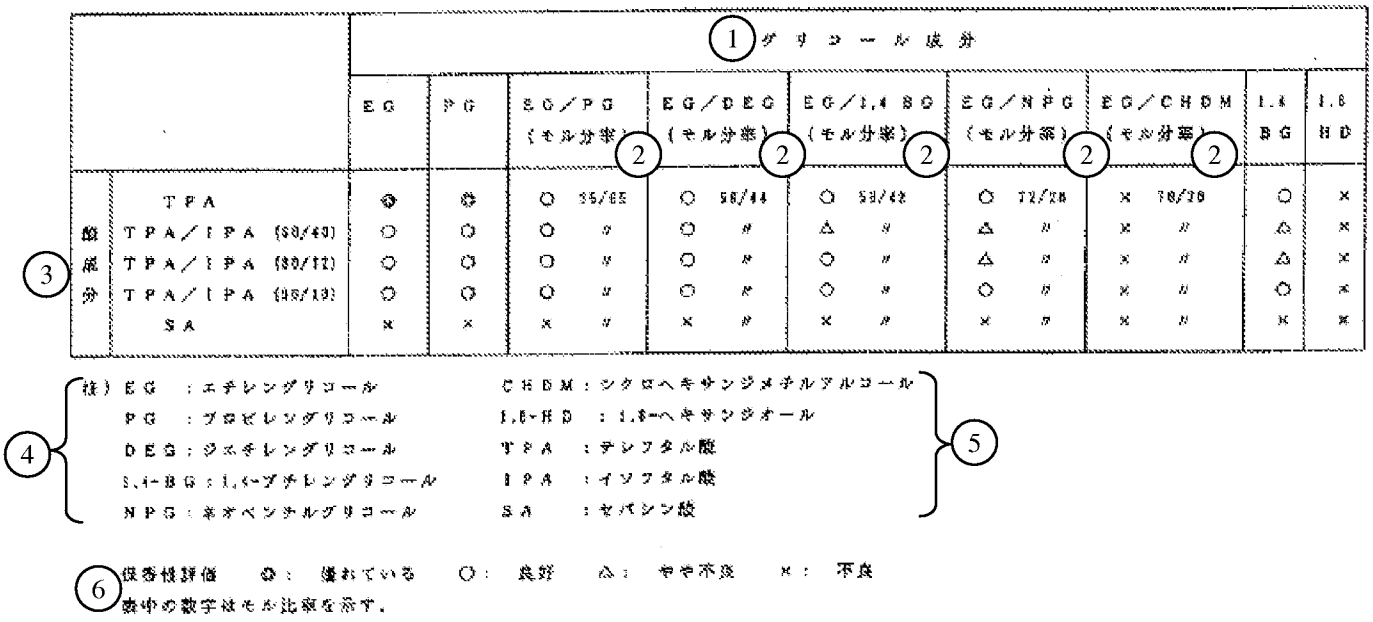
metal plate, and it was found that amorphous [films] were preferable in many respects.

That is, it was found that while a crystalline polyester became amorphous as its crystallinity was lost when laminated, the laminated film fell off, or cracks were created, as it became brittle as crystallization progressed as heated during the can-making, printing, and heat sterilization steps. Thus, in the present invention, further examinations were conducted in search for an amorphous polyester with minimal crystallization problems attributable to heat history subsequent to the can-making step or a polyester

with a low level of crystallinity, and the metal can lining polyester film of the present invention with the aforementioned configuration was completed as a result.

The present invention will be explained in further details below with the inclusion of explanations of the experiments. First, as the basic characteristics, it is critical for the film to have excellent taste- and flavor-retaining performances. Aroma-retaining properties of a various kinds of polyesters were examined in order to find a polyester film with said [properties], and the results shown in Table 1 were obtained.

TABLE 1



Key: 1 Glycolic element

2 Molar fraction

3 Acidic element

4 Notes

EG: ethylene glycol

PG: propylene glycol

DEG: diethylene glycol

1,4-BG: 1,4-butylene glycol

NPG: neopentyl glycol

CHDM: cyclohexane dimethyl alcohol

1,6-HD: 1,6-hexanediol

TPA: terephthalic acid

IPA: isophthalic acid

SA: sebacic acid

6 Aroma-retaining property evaluation

⊙: Excellent ○: Good △: Somewhat poor X: Poor

Numbers in the table indicate molar fractions.

The results indicated that polyester films containing TPA or a mixture of TPA and IPA as acidic /4
element and 1 or more kinds of elements selected among EG, PG, and 1,4-BG as glycolic elements had a particularly superior flavor-proof property. To the contrary, it was found that polyester [films] containing a sebacic acid as acidic element and polyester films containing 1,5-HD as glycolic element should be eliminated from the viewpoint of [having poor] flavor-proof property.

On the other hand, of the aforementioned polyester films with a good flavor-proof property, polyester films that contains 100% TPA as acidic element yet no IPA as acidic element show intense crystallinity. As such, crystallization progresses due to the heat environment after the lamination, and exfoliation and cracks are likely to take place. Therefore, a polyester film that contains only TPA as acidic element cannot be adopted when post-lamination thermal deterioration is taken into consideration. In addition, because the polyester film pertaining to the present invention needs to be fused to the metal can, a film

that maintains a stable quality without becoming dissolved at the fusing temperature (usually, 200-240°C) must be used. However, because the fusion itself cannot be achieved or becomes unstable if [the film] does not melt to some extent, its is desirable that the melting point is 240°C or lower.

Polyester films that satisfied the aforementioned various requirements were further examined, and a polyester film comprising 50-95 mol% of terephthalic acid and 50-5 mol% of isophthalic acid as its acid elements and/or orthophthalic acid and glycols with a carbon number of 2-5 as the glycol component was found to meet the aforementioned requirements. However, because satisfying the aforementioned requirements still retains the risk that the crystallinity might be increased under the heat environment that follows the can-making step, depending on combinations and compositions of the acidic and glycolic elements, the ratio between the aforementioned acidic and the glycolic elements must be adjusted as needed within the aforementioned mixing ratio range. Here, a measure to be used for adjusting the mixing ratio is the specific gravity (measured by means of Micro Raman method) obtained when the polyester film is treated under the following heat treatment condition.

Heat treatment condition of 210°C x 2 min

That is, in the case of the polyester film pertaining to the present invention, it is essential that the specific gravity after the aforementioned heat treatment is 1.350 or lower. If the specific gravity exceeds 1.350, excessive crystallization progresses in the heat environment that follows the can-making step, and deterioration of the material will occur.

The basic configuration of the present invention is described above. At this point, such a lubricant as calcium carbonate or thyroid may be added for the purpose of improving the workability during the film formation step and the metal can lamination step, or such a surface treatment as a corona discharge treatment or a chemical treatment may be applied to one surface of the film as needed for the purpose of improving its adhesion to the metal plate. Furthermore, an addition of such an additive as a polyester

improving agent is also permitted. Furthermore, although an ordinary polyester film has a whitening problem when applied with a retort treatment (130°C x 30 min), the whitening problem can be solved if a copolyester is added.

In addition, it is desirable that the polyester film pertaining to the present invention is drawn uniaxially or biaxially, whereby damage to the film during the can-making can be reduced by matching the direction the film is drawn with the direction it becomes deformed during the can-making. Furthermore, it is desirable that the film is 9-50 μm thick, or preferably, 20-25 μm. If it is thinner than 9 μm, the film becomes likely to break during the can-making process due to its excessive thinness. On the other hand, if it exceeds 50 μm, the quality becomes too high, which is uneconomical.

In addition, the aforementioned Al, Fe, and their bimetal materials may be exemplified as materials to be used for the metal can to which the polyester film of the present invention is affixed, and the metal can of the present invention can be obtained by affixing the film of the present invention to its inner surface according to the aforementioned steps. Here, it is recommended to apply an Sn plating to the applicable part of the outer surface of the metal can material for the purpose of improving the workability during the drawing processing.

Application examples

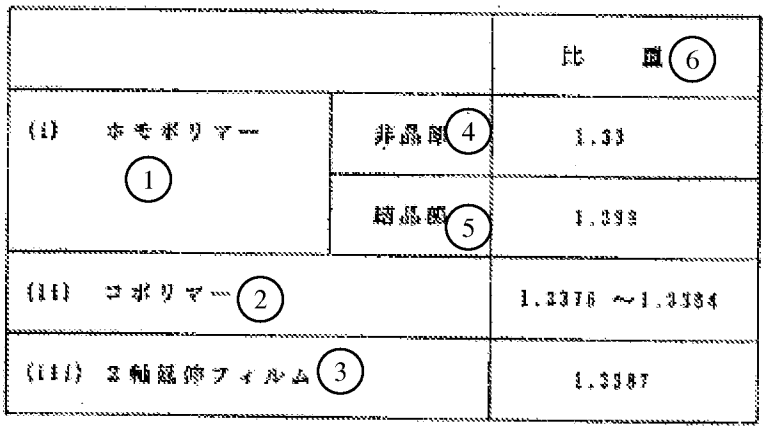
(i) Homopolymer: TPA/EG = 100/100 (wt%)

(ii) Copolymer: TPA/IPA/EG = 78/22/100 (wt%)

(iii) Biaxially drawn film made of a copolymer comprising TPA/IPA/EG = 78/22/100 (wt%) /5

When specific gravity (S. G) of the aforementioned polymers (i) and (ii) or the film in (iii) were measured using the Micro Raman method, the results shown in Table 2 were obtained.

TABLE 2



Key: 1 Homopolymer

2 Copolymer

3 Biaxially drawn film

4 Amorphous part

5 Crystalline part

6 Specific gravity

Then, when specific gravities of polyester films of various compositions and those of films that were obtained by applying a heat treatment to said films under the following conditions [were composed], the results shown in Table 3 were obtained.

Heat treatment condition of 210°C x 2 min

TABLE 3

	(1) 組成					(4) 融点 (℃)	(5) 比重			
	(2) 酸成分 (モル%)			(3) グリコール成分 (モル%)			(6) 熱処理前			熱処理後 (7)
	TPA	IPA	OPA	EG	PG		(8) 非晶部のみ	(9) 結晶部のみ	(10) 全体	全体 (10)
1	78	22	—	100	—	209	1.3329	1.4235	1.3613	1.3228
2	82.4	17.6	—	100	—	224	1.3360	1.4238	1.3688	1.3118
3	86.8	13.2	—	100	—	237	1.3362	1.4410	1.3715	1.3419
4	89	11	—	100	—	239	1.3364	1.4403	1.3768	1.3455
5	100	—	—	100	—	250	1.3370	1.4502	1.4008	1.3800
6	55	45	—	100	—	197	1.3118	1.4199	1.3328	1.3211
7	94	6	—	100	—	250	1.3310	1.4377	1.3790	1.3458
8	85	15	—	—	100	205	1.2819	1.4256	1.3388	1.3215
9	85	15	—	50	50	130	1.2723	1.4213	1.3319	1.3210
10	90	—	10	100	—	240	1.3217	1.4428	1.3701	1.3487
11	80	—	20	100	—	200	1.3248	1.4419	1.3657	1.3321

Note) OPA: Orthophthalic acid

Key:
1 Composition
2 Acidic element (mol%)
3 Glycolic element (mol%)
4 Melting point
5 Specific gravity
6 Before heat treatment
7 After heat treatment
8 Amorphous part only
9 Crystalline part only
10 Overall

Effect of the invention

The present invention is configured in the aforementioned manner. As a result, a polyester film with an excellent flavor-proof property that can be fused to the metal plate, endures the deformation by the drawing during the can-making step without being damaged, and is free from exfoliation and cracks in the heat environment that follows the can-making step, as well as a metal can with said film as a lining can be presented. As a result, a metal can lining technology that utilizes film lamination in place of the conventional spray-coating is able to be implemented, and the production cost of the metal can can be reduced.